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Diversity and distribution of blister beetles (Coleoptera, Meloidae) from north-western Saudi Arabia: new observations and first description of a male *Mylabris desertica* Bologna, 2007

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Abstract

Background

This study presents the first faunistic records of blister beetles (Coleoptera, Meloidae) from north-western Saudi Arabia, specifically Hejaz mountains and north Tihama,

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expanding the known distribution range of the species within the country. Field surveys were conducted between 2022 and 2024, aiming to cover different seasons. These observations contribute to the knowledge of the diversity of meloid fauna of the country and underscoring the importance of continued faunistic exploration in north-western Saudi Arabia, a region that remains relatively under-surveyed in terms of meloid diversity.

New information

Three species (*Hycleus borchmannianus*, *Hycleus trizonatus*, *Mylabris filicornis*) and one genus (*Sitaris*) are recorded for the first time in Saudi Arabia. Besides that, this work also provides the first description of the male morphology and genitalia of *Mylabris desertica* Bologna, 2007.

Keywords

Arabian Peninsula, Middle East, desert fauna, new records, arid environment

Introduction

The north-western region of Saudi Arabia remains one of the least explored areas of the country in terms of insect biodiversity, with many insect groups still lacking comprehensive taxonomic studies or recent revisions. Notably, no comprehensive surveys or studies have focused on beetles (Coleoptera) from this part of the Kingdom. The present study represents the first systematic investigation of beetles from the family Meloidae (blister beetles), in north-western Saudi Arabia and, to our knowledge, the first systematic study of any beetle group from this region.

The first comprehensive work on the family Meloidae from the Arabian Peninsula was written by Kaszab (1983), who also described one genus, 16 species and three subspecies that were new to science. The list of species occurring in Saudi Arabia was subsequently expanded by Schneider (1991), who described one new species and provided several new distribution records. The most recent and extensive checklist for the Arabian Peninsula was provided by Bologna and Turco (2007), who reviewed all previously published literature and described five new species. Since then, one new species of *Mesomeloe* has been described from Qatar (Sánchez-Vialas et al. 2021a). According to their works, a total of 88 species and 10 subspecies of Meloidae have been recorded from the Arabian Peninsula, of which 75 species and nine subspecies occur in Saudi Arabia. Since the publication of their checklists, only eight additional records from Saudi Arabia have been published (El-Hawagry et al. 2013, El-Hawagry et al. 2015, Abdel-Dayem et al. 2017, Abdel-Dayem et al. 2020, Alzahrani et al. 2025). The majority of the existing knowledge on the Meloidae of the Arabian Peninsula is restricted to its south-western region, while the Hejaz mountain range and northern Tihama still remain largely unexplored. This geographic gap highlights the potential for the discovery of

additional species and the expansion of the current checklist of Arabian meloids (Bologna and Turco 2007).

Within the family Meloidae, *Mylabris* (*Mylabris*) *desertica* was described by Bologna and Turco (2007) from a single, partly damaged, female specimen collected from Saudi Arabia, thus leaving the male morphological features undescribed. When only the female of a species is known, describing the male becomes essential for achieving a complete taxonomic characterisation. In many insect groups, including Meloidae, male genitalia represent the most stable and diagnostically informative morphological trait, often exhibiting clear interspecific differences that enable confident identification (Song and Bucheli 2010). Documenting the male morphology not only resolves existing taxonomic gaps, but also provides a foundation for further taxonomic revisions and phylogenetic studies within the group.

This work helps to fill the significant biogeographic and taxonomic gaps in north-western Saudi Arabia and provides critical insights into the diversity, distribution and conservation needs of the local insect fauna. New distributional records of species from Meloidae family are presented, including first records of three species and one genus in the country. Finally, the study provides the first description of the male of *M. desertica*, providing photographs and drawings of diagnostic characters.

Materials and methods

Study area

The study area, encompassing approximately 97,605 km², is situated in the north-western region of the Saudi Arabia. Topographically, elevation varies markedly, ranging from -6 metres along the Red Sea coastline to a maximum of 1,958 metres at Khaybar White Volcano in the south-eastern sector. The landscape is predominantly shaped by the Hijaz Mountain range, which comprises several prominent volcanic and mountainous formations exceeding 1,000 metres in elevation. Wetlands are mostly absent from the study area and, in the mountain regions, they are scarce, predominantly isolated and ephemeral. Wadi Al Hamd in the southwest is the only permanent water source (Lehner et al. 2008).

Although the study region is predominantly arid, there is a pronounced longitudinal gradient in annual precipitation (Fick and Hijmans 2017). Western coastal zones exhibit extremely low precipitation levels, whereas precipitation increases markedly towards the interior. Temperature patterns tend to follow the altitudinal variation, with higher mean annual temperatures (26.8°C) recorded in southern lowland coastal areas and lower temperatures (16.2°C) in northern and highland inland regions. The majority of the region is classified as hyper-arid, with only the mountain peaks and eastern zones classified as within the arid category (Trabucco and Zomer 2018).

Fieldwork was conducted in 13 conservation areas managed by The Royal Commission for AlUla and the Red Sea Global, including one Biosphere Reserve (Harrat Uwayrid),

one Geopark (Khaybar White Volcano), one National Park (Sharaan), three Nature Reserves (Gharameel, Harrat AlZabin, Wadi Nakhlah), one Area Rich in Biodiversity (Jabal Nakhlah) and six local Key Biodiversity Areas (Amaala Northern Mountains, Jabal Ral and Northern Areas, Jabal Saykhaan, Harrat Lunayyir, Triple Bay Mountains and Wadi Al Hamd) (UNEP-WCMC 2019, El-Bana et al. 2025) (Fig. 1).

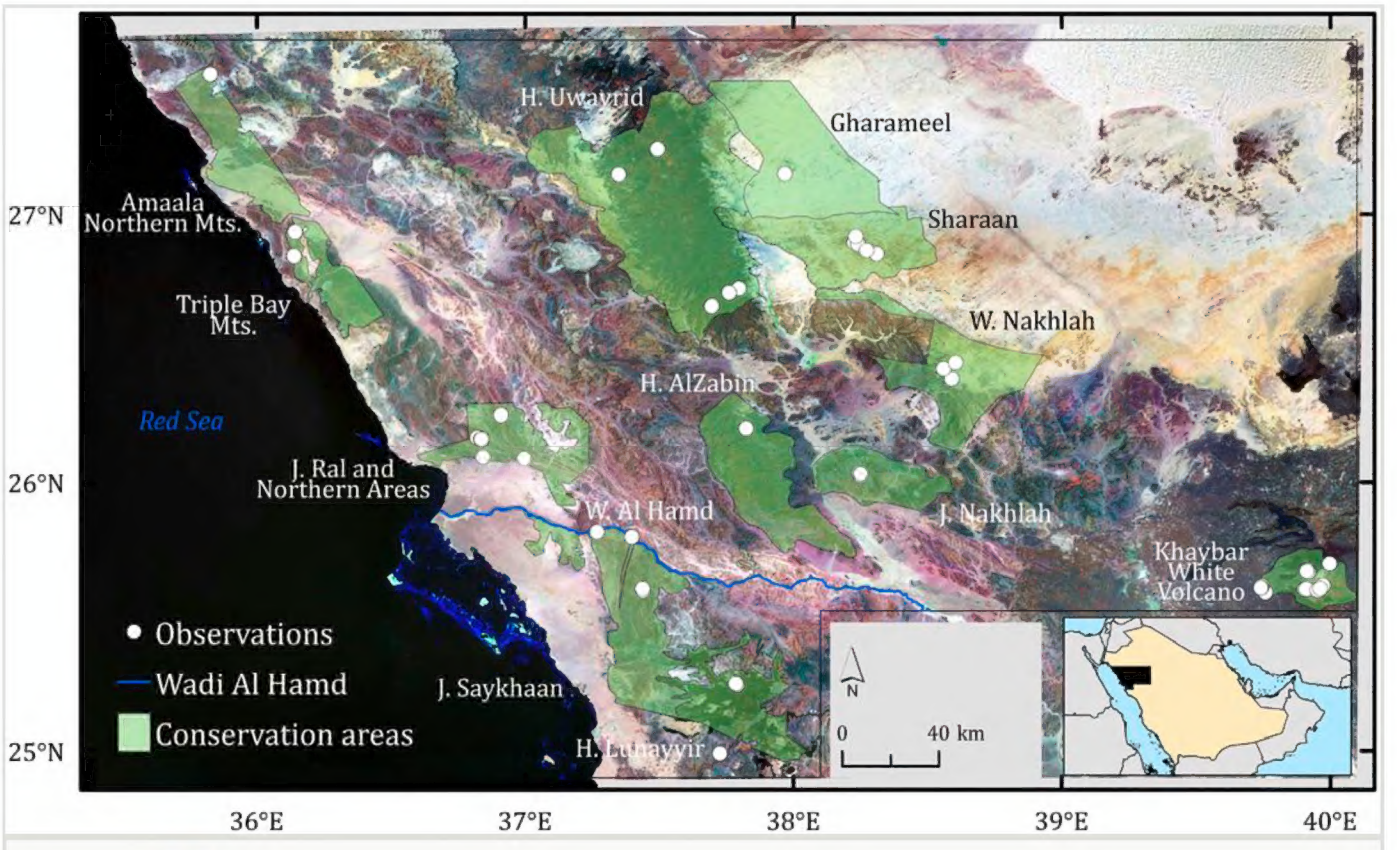

Figure 1. doi

Localities of records of Meloidae (n = 75) in the study area and location of the study area in the north-western Saudi Arabia (small inset).

Data sampling and analysis

Fieldwork was conducted between November 2022 and October 2024. During this period, seven field missions were carried out, lasting for 230 days in total, covering various seasonal and environmental conditions spread across 231 different sites. Collecting was performed by random walks, covering different types of microhabitats in each site. Most of the species were collected on flowering plants during the daytime, some were instead found on the ground during the night (*Mesomeloe coelatus* and *Eurymeloe saharensis)* and some were attracted by the headlamp or light trap (*Lydomorphus* spp. and *Zonitoschema* spp.). Specimens were collected by hand and preserved in ethanol (99%) for morphological investigation. Geographic coordinates were taken with a GPS using the WGS84 datum. Photos of specimens in the field were taken with an Olympus tough TG-6.

Collected specimens were mounted on mounting boards or directly pinned through the right elytron. Photographs of whole specimens were taken using a Nikon D5300 digital camera, equipped with a Tamron SP Di AF 90 mm F/2.8 macro lens and a Sigma EM-140 DG ring flash with a DIY light diffuser. Digital images of *Mylabris desertica* were taken

using a Canon EOS 750D with the Canon MP-E 65 mm macrolens. The specimens are deposited in the collection of AlUla Museum and Jihočeské muzeum v Českých Budějovicích [The South Bohemian Museum in České Budějovice] (JMBC) with URN numbers not yet assigned.

Identification of specimens was performed by the second author. The taxonomic arrangement is used according to Bologna (2020), except for Meloini where Sánchez-Vialas et al. (2021b) and Sánchez-Vialas et al. (2022) were followed. Sánchez-Vialas et al. (2021b) were relied upon because they presented a fully supported molecular phylogeny and clear evidence that genus *Meloe* Linnaeus, 1758 is paraphyletic and should be divided into several genera. However, Riccieri et al. (2024) did not accept this elevation, with the argument based on larval and adult morphology and preliminary molecular evidence which are part of ongoing, unpublished work, meaning that no currently available data justify departing from the conclusions of Sánchez-Vialas et al. (2021b). Species *Zonitoschema iranica* was identified, based on Batelka and Bologna (2014). The complete dataset is available in Suppl. material 1.

Taxon treatment

Mylabris (*Mylabris*) *desertica* Bologna, 2007

Material

a. country: Saudi Arabia; stateProvince: Tabuk; municipality: Umluj; locality: 45km E of Umluj; maximumElevationInMeters: 721; verbatimCoordinates: 24.990833N, 37.725556E; eventDate: 18.03.2024.; recordedBy: Lakušić Vidak; associatedReferences: VLA_4104; occurrenceID: D867E344-30D9-520C-AF61-0A72FF8F8FAE

Description

Length: 11.5 mm (Fig. 2). Body uniformly black, the macrosetation is mixed black and white, with white predominating on the abdomen and ventral side of the thoracic segments.

Head is black, frons with a red spot. Head capsule as long as wide with large and sparse punctures, except for the frontal area, where it is dense; surrounding surface smooth and shiny. Temples parallel and rounded posteriorly, shorter than eyes in lateral view. Macrosetation of the head long and erect, black. Clypeus transverse, wider than long, convex with fore margin rounded. Apical third is smooth, the rest rugose, strongly punctured to wrinkled, fronto-clypeal suture clearly visible. Labrum as long as clypeus, wider, anterior margin slightly emarginate, longitudinally depressed in the middle, almost smooth with long black setation, except fore margin, where it is short and whitish. Mandibles well developed with long macrosetation laterally, not regularly convex, but bent at the middle and at apex, longer than clypeus and labrum together. Maxillary palpomeres with long setae, last maxillary palpomeres are obtusely pointed. The eyes are broadly oval. Antennae black, composed of

eleven, progressivelly widened, well-separated segments. The last four segments (VIII-XI) clearly wider than the others. Antennomeres I–II with long macrosetation, black; III–VII with short macrosetation, shiny with faint reddish-brown tinge; antennomere III 1.4x as long as IV; antennomere XI 1.5x as long as X and tapering to the faint tip.

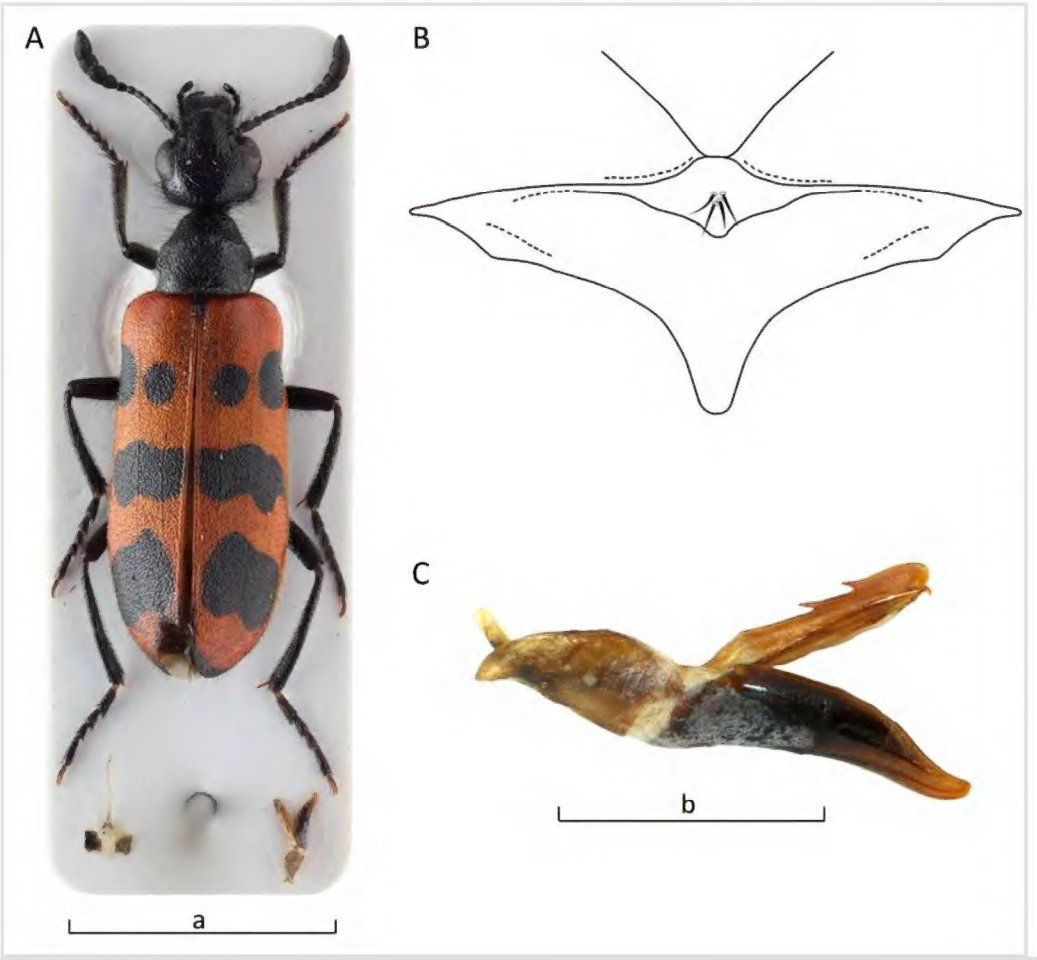

Figure 2. doi

Mylabris desertica (VLA_4104): **A** habitus; **B** mesosternal sclerite; **C** aedeagus. Bar size a = 5 mm, b = 1 mm. Photo credits Ladislav Černý.

Pronotum is longer than wide, tapered in front, with a distinct dorsal depression; macrosetation long, erect, black mixed whitish; with large punctures, laterally and posteriorly contiguous. Mesosternum with developed scutum with a few distinctive macrosetae in its posterior part (Fig. 2B).

Elytra covered with sparse, black and white and slightly inclined macrosetae. The black pattern of each elytron consists of short black emargination of the suture behind the scutellum; of two sub-basal black spots, sutural and humeral, the humeral is larger; a transverse medial black spot closely spaced to the suture, but not reaching the outer margin; an irregular postmedian black spot not reaching the margins; and the apex is narrowly black (Fig. 2A).

Legs are black with black setation, except for the fore tibiae, where it is mixed with short whitish setation inwardly. Longer black setae are dorsally and laterally on protarsomeres I–IV. Tibial spurs pointed, except the metatibial outer one, which is obtusely ended. The blades of tarsal claws are smooth without denticulation or

microcrenulation and the ventral ones are well developed, sharply pointed and reaching the length of the dorsal ones.

Male genitalia. Aedeagus (Fig. 2C) with two subequal dorsal hooks, positioned in the middle of the distal half, closely spaced and of equal inclination in *isoharpagae* form. Endophallic hook slender and curved apically. Parameres are slender, concave in lateral view and ca. 2x as long as phallobase, with a pointed and slightly curved apex.

Checklist of Meloidae of north-western Saudi Arabia

Alosimus syriacus subsp. *syriacus* (Linnaeus, 1758)

Materials

a. country: Saudi Arabia; locality: Harrat Uwayrid; eventDate: 19/2/2023; associatedReferences: VLA_0846; occurrenceID: ECD45199-BE0E-50FA-BF6F-4FB83E3D893B
b. country: Saudi Arabia; locality: Harrat Uwayrid; eventDate: 19/2/2023; associatedReferences: VLA_0852; occurrenceID: 8F0A9AE3-3BE8-57CC-A8FA-C0BDD5F76C55
c. country: Saudi Arabia; locality: Harrat Uwayrid; eventDate: 21/2/2023; associatedReferences: VLA_0901; occurrenceID: DD9EF31A-FBB2-5D6C-9D78-0B39D7E4723B
d. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 3/3/2023; associatedReferences: VLA_1142; occurrenceID: 2EDDE188-6342-5F4F-ADAC-166BBEB0ED31
e. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 3/3/2023; associatedReferences: VLA_1148; occurrenceID: 43E1E9C1-E4E4-59A5-9263-FD43DE0C0536
f. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 4/3/2023; associatedReferences: VLA_1210; occurrenceID: 44E87172-C885-552D-A1B5-3860246FFDF9

Diagnosis: Suppl. material 2.

Lydomorphus angusticollis subsp. *suturellus* (Haag-Rutenberg, 1880)

Materials

a. country: Saudi Arabia; locality: Jabal Ral and Northern Areas; eventDate: 5/4/2024; associatedReferences: VLA_3325; occurrenceID: 753FD154-6CE0-55C7-8608-C99649BF8CB3
b. country: Saudi Arabia; locality: Jabal Ral and Northern Areas; eventDate: 7/4/2024; associatedReferences: VLA_3371; occurrenceID: 6B194808-BB16-5194-874A-18E5ECF1B07B

Diagnosis: Suppl. material 3.

Lydomorphus brittoni (Kaszab, 1953)

Materials

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 4/3/2023; associatedReferences: VLA_1232; occurrenceID: 5C73E8ED-33C1-5C86-80A9-9564B3FB1E23
b. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 8/5/2023; associatedReferences: VLA_1495; occurrenceID: 48AA5C65-F309-5126-B2AD-7A7146C25781
c. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 11/5/2023; associatedReferences: VLA_1614; occurrenceID: 0274FE1B-6CBB-563F-8D91-B5C6B1480E41

Diagnosis: Suppl. material 4.

Lydomorphus palaestinus (Kirsch, 1870)

Materials

a. country: Saudi Arabia; locality: Sharaan; eventDate: 24/2/2023; associatedReferences: VLA_0957; occurrenceID: 185D18D3-6898-5DF8-B954-455CBF3BD913
b. country: Saudi Arabia; locality: Sharaan; eventDate: 25/2/2023; associatedReferences: VLA_0994; occurrenceID: C4BFB526-C6C4-5661-958C-C983EAC30021

Diagnosis: Suppl. material 5.

Ammabris elegans Olivier, 1811

Material

a. country: Saudi Arabia; locality: Sharaan; eventDate: 24/5/2023; associatedReferences: VLA_1812; occurrenceID: 039CDC51-0C69-5D08-AD36-AC61CE7582BA

Diagnosis: Suppl. material 6.

Croscherichia goryi (Marseul, 1870)

Materials

a. country: Saudi Arabia; locality: Sharaan; eventDate: 26/5/2023; associatedReferences: VLA_1868; occurrenceID: DC12F81D-832C-51B8-9262-04806D0FC002
b. country: Saudi Arabia; locality: Sharaan; eventDate: 26/5/2023; associatedReferences: VLA_1872; occurrenceID: 01B48321-8166-545A-B5E2-7FA5E2E4A95D
c. country: Saudi Arabia; locality: Sharaan; eventDate: 26/5/2023; associatedReferences: VLA_1873; occurrenceID: 4564FD9D-D095-5EE9-8DF5-1E36ECE86D5B
d. country: Saudi Arabia; locality: Harrat Lunayyir; eventDate: 21/4/2024; associatedReferences: VLA_3599; occurrenceID: 934C4BD1-E964-5A78-B394-82EB97807139

Diagnosis: Suppl. material 7.

Croscherichia sanguinolenta subsp. *arabica* Bologna, 1991

Materials

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 10/5/2023; associatedReferences: VLA_1541; occurrenceID: A073816E-823A-5E33-A12A-24C13C1C7CCC

b. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 10/5/2023; associatedReferences: VLA_1542; occurrenceID: FC767F31-8592-518B-994C-F486CC396081

Diagnosis: Suppl. material 8.

Croscherichia tigrinipennis (Latreille, 1827)

Material

a. country: Saudi Arabia; locality: Jabal Saykhaan; eventDate: 15/3/2024; associatedReferences: VLA_3125; occurrenceID: F92AF415-B622-578D-B430-E5DDC6903915

Diagnosis: Suppl. material 9.

Hycleus borchmannianus (Kaszab, 1983)

Material

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 12/5/2023; associatedReferences: VLA_1627; occurrenceID: AE5B9480-DF34-5DE9-A1D9-07A916C87F02

Diagnosis: Suppl. material 10.

Notes: This is the first record for Saudi Arabia, previously considered endemic to Yemen (Fig. 3).

Hycleus novemdecimpunctatus (Olivier, 1811)

Materials

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 9/5/2023; associatedReferences: VLA_1506; occurrenceID: CCFF0C76-B2C0-5A21-A36F-CA95B0199D8B

b. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 10/5/2023; associatedReferences: VLA_1547; occurrenceID: 878FD6CD-6158-53FE-A1D4-60D6127BAE39

c. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 11/5/2023; associatedReferences: VLA_1608; occurrenceID: 6DC0FA0E-4F81-56E6-BDBB-3BDFEE405E42

d. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 12/5/2023; associatedReferences: VLA_1624; occurrenceID: 6D8E2759-985F-5E5F-A201-D3B336C69CE5

Diagnosis: Suppl. material 11.

Figure 3. doi

Hycleus borhcmanianus (VLA_1627). Bar size = 5 mm. Photo credits Nikola Vesović.

Notes: Taxonomic decision published by Pardo-Alcaide (1954) was adopted, which is in contrast to Kaszab (1983) who considered this species to be *H. semifasciatus* (Pic, 1895), currently listed as a junior subjective synonym of *H. novemdecimpunctatus* (*Bologna 2020*). In fact, *H. semifasciatus* differs from the original description of *H. novemdecimpunctatus* (Olivier 1811) due to the absence of a black scutellar spot, which also does not occur in the material collected nor in all the material analysed from other areas of its distribution (Morocco, Tunisia, Israel to Saudi Arabia).

Hycleus pseudobrunnipes (Kaszab, 1983)

Materials

a. country: Saudi Arabia; locality: Jabal Nakhlah; eventDate: 2/2/2023; associatedReferences: VLA_0523; occurrenceID: 0F4B870B-6884-5262-999D-A27B5E8952C9

b. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 9/5/2023; associatedReferences: VLA_1512; occurrenceID: BA6AC022-0275-54B9-8A12-2294F97987FD

c. country: Saudi Arabia; locality: Jabal Ral and Northern Areas; eventDate: 4/4/2024; associatedReferences: VLA_3282; occurrenceID: D385B396-468E-501D-A2F3-BF41B70187B3

d. country: Saudi Arabia; locality: Jabal Ral and Northern Areas; eventDate: 4/4/2024; associatedReferences: VLA_3283; occurrenceID: 327EDAE2-43A1-5618-B79B-FC0E598163D3

e. country: Saudi Arabia; locality: Jabal Ral and Northern Areas; eventDate: 5/4/2024; associatedReferences: VLA_3319; occurrenceID: D271D2B0-B973-5B2B-9803-08E984DB0A75
f. country: Saudi Arabia; locality: Jabal Ral and Northern Areas; eventDate: 6/4/2024; associatedReferences: VLA_3330; occurrenceID: F3B2A034-7133-5ABE-9C66-5D408C9D407D
g. country: Saudi Arabia; locality: Harrat Lunayyir; eventDate: 22/4/2024; associatedReferences: VLA_3604; occurrenceID: 0905F7B5-FA7D-5F61-A6F7-41D57EF8B539

Diagnosis: This species exhibits considerable morphological variability, particularly in the elytral pattern and body size. The elytral markings can consist of isolated spots, which often merge to form partially transverse irregular bands (Suppl. material 12).

Hycleus scabratus (Klug, 1834)

Material

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 10/5/2023; associatedReferences: VLA_1548; occurrenceID: B887F732-5325-55D2-B7F1-555041ED9970

Diagnosis: Most observed specimens of this species represent a typical elytral pattern described by Klug (1834). However, there is also a known form of elytral pattern with a small sub-basal spot which was described by Kaszab (1983) as an aberration beta. The collected specimen has a more expanded sub-basal spot which forms a subtrapezoidal spot. This is the first record of such an elytral pattern (Fig. 4, Suppl. material 13).

Figure 4. doi

Elytral pattern of *Hycleus scabratus* (VLA_1548), bar size = 5 mm. Photo credits Nikola Vesović.

Hycleus trizonatus (Reiche, 1866)

Material

a. country: Saudi Arabia; locality: Gharameel; eventDate: 7/3/2023; associatedReferences: MPA_0902; occurrenceID: A5DC9A36-C943-5099-8A79-439B39FCDAA0

Notes: New record for Saudi Arabia (Fig. 5).

Figure 5. doi

Hycleus trizonatus (MPA_0902). Bar size = 5 mm. Photo credits Nikola Vesović.

Genus *Hycleus*

Materials

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 9/5/2023; associatedReferences: VLA_1520; occurrenceID: BA78E054-5E0F-526F-95D3-9E11F82AE7D3

b. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 12/5/2023; associatedReferences: VLA_1626; occurrenceID: B01E4A33-9974-51CD-AD6B-1EB6FA80DF60

c. country: Saudi Arabia; locality: Harrat AlZabin; eventDate: 16/6/2023; associatedReferences: VLA_2224; occurrenceID: 006C494A-18D9-53A2-ABA6-197504D61E78

d. country: Saudi Arabia; locality: Jabal Saykhaan; eventDate: 12/3/2024; associatedReferences: VLA_3057; occurrenceID: 2257719E-92F4-5940-970B-C42BA76675AE

e. country: Saudi Arabia; locality: Triple Bay Mountains; eventDate: 12/4/2024; associatedReferences: VLA_3424; occurrenceID: A7ED4606-6C75-53B4-954C-0699CB08B904

f. country: Saudi Arabia; locality: Triple Bay Mountains; eventDate: 14/4/2024; associatedReferences: VLA_3466; occurrenceID: 52069E0C-98BC-537F-B4C3-B46A1CD17EE5

Notes: Due to the mesogorbatus type of mesosternum and the shape of male genitalia, this species clearly belongs to the *sexmaculatus* group as defined by Serri et al. (2020). It differs from all known species of the group and it is closest to *H. tenuepictus* known from Anatolia, Egypt and Levant. It has a partly similar elytral pattern, the general shape of the antenna and the last antennal segment. It differs from *H. tenuepictus* due to its slightly reduced ventral blade of the tarsal claws, while, in *H. tenuepictus*, they are well developed and robust. It has a more slender and rather sparsely punctured pronotum. The displayed specimen from Hedjaz in Kaszab (1983) (Plate 2, fig. 21) may also belong to this taxon. Tentatively, it is kept as *Hycleus* sp. (Fig. 6).

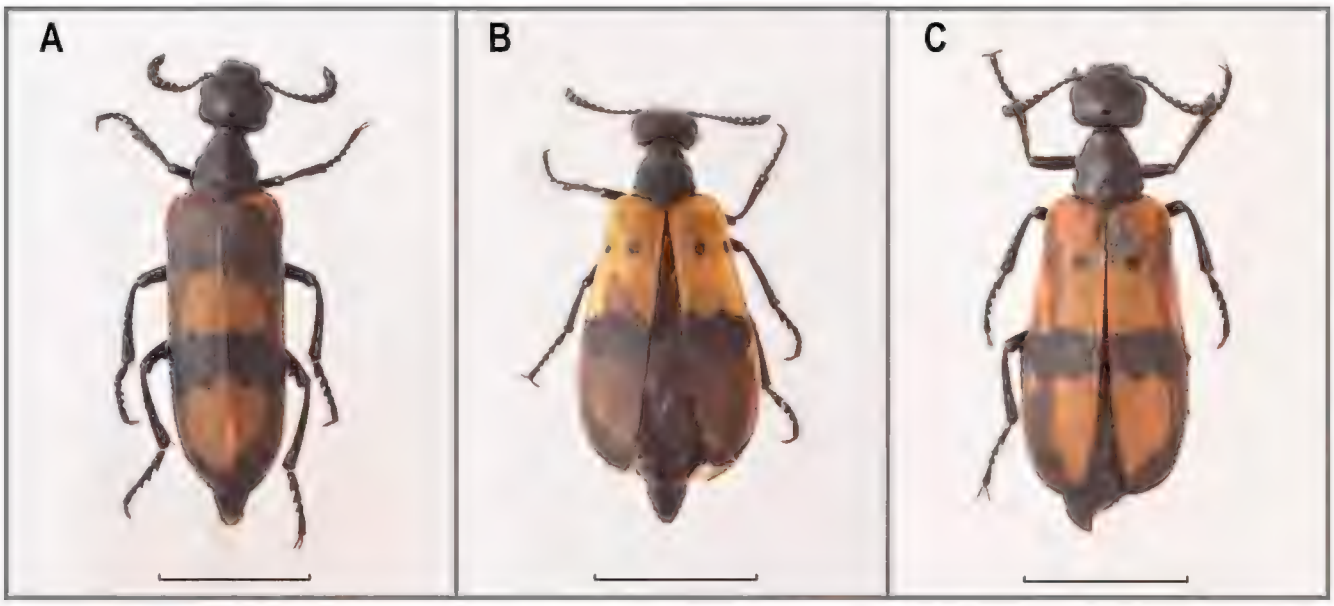

Figure 6. doi

Habitus of *Hycleus* sp.: A) VLA_3424, B) VLA_3466, C) VLA_3057. Bar size = 5 mm. Photocredits Nikola Vesović.

Mylabris (*Eumylabris*) *calida* (Pallas, 1782)

Materials

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 8/5/2023; associatedReferences: VLA_1490; occurrenceID: BEE53B8C-D94C-5CD1-B44C-20EF5BC75832

b. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 8/5/2023; associatedReferences: VLA_1498; occurrenceID: B56E189A-3F17-5FA9-ADA5-1793A257EE7F

c. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 9/5/2023; associatedReferences: VLA_1505; occurrenceID: 23837851-AF25-5754-ABA9-00582CED1805

d. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 9/5/2023; associatedReferences: VLA_1511; occurrenceID: D715C269-4A07-5BE2-958F-900E4C2DD3E2
e. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 10/5/2023; associatedReferences: VLA_1528; occurrenceID: DA8954E3-64BC-51B4-8688-17C9B891587E
f. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 10/5/2023; associatedReferences: VLA_1543; occurrenceID: A67770B9-B798-56D8-890D-F8AB04A0A5A1
g. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 11/5/2023; associatedReferences: VLA_1605; occurrenceID: 603F32A9-3F41-58DE-95BE-15EB80C30A7D
h. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 12/5/2023; associatedReferences: VLA_1620; occurrenceID: 23B2D6B4-2703-5B51-91FA-0F2D006D0CF9

Diagnosis: Suppl. material 14.

Mylabris (*Mylabris*) *desertica* Bologna, 2007

Materials

a. country: Saudi Arabia; locality: Jabal Saykhaan; eventDate: 12/3/2024; associatedReferences: VLA_3056; occurrenceID: 5E93DC77-61AC-5DB7-B8B5-124B4F8D28BB
b. country: Saudi Arabia; locality: Amaala Northern Mountains; eventDate: 21/3/2024; associatedReferences: VLA_3202; occurrenceID: EA861558-E484-5F64-A65D-739F5BB2603D
c. country: Saudi Arabia; locality: Jabal Ral and Northern Areas; eventDate: 7/4/2024; associatedReferences: VLA_3365; occurrenceID: A6D6458E-561E-570B-AFE3-D0DE1BCD63AE
d. country: Saudi Arabia; locality: Triple Bay Mountains; eventDate: 14/4/2024; associatedReferences: VLA_3474; occurrenceID: C22D11B5-8C40-5C43-B4FE-D8CC6BEEE424
e. country: Saudi Arabia; locality: Harrat Lunayyir; eventDate: 18/3/2024; associatedReferences: VLA_4104; occurrenceID: 12892F0A-D69E-5860-AF99-24531D1FD98E

Mylabris (*Mauritabris*) *filicornis* Marseul, 1870

Material

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 12/5/2023; associatedReferences: VLA_1622; occurrenceID: DA3A8EAE-B44C-5635-9E72-F666D670EBEF

Diagnosis: Suppl. material 15.

Notes: New record for Saudi Arabia (Fig. 7).

Figure 7. doi

Mylabris filicornis (VLA_1622). Bar size = 5 mm. Photo credits Nikola Vesović.

Mylabris (*Mauritabris*) *tenebrosa* Laporte de Castelnau, 1840

Materials

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 12/5/2023; associatedReferences: VLA_1621; occurrenceID: 44C944B9-EBE6-5C31-B9D9-C77274BA4530

b. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 12/5/2023; associatedReferences: VLA_4004; occurrenceID: 8F9DA121-57C0-5FB3-B271-4A1EA8AA9F0B

Diagnosis: Suppl. material 16.

Notes: The first record for the country was published by Schneider (1991). The typical *M. tenebrosa* originally described from Algeria slightly differs. Specimens from Saudi Arabia are larger in body size and have a longer setation of the fore part of the body. These specimens perfectly match the original description of *M. interrupta* (Olivier, 1811) and also partly *M. longipilis* (Pic, 1897), an enigmatic species never studied after its description. Both mentioned species are, according to their description, distributed in Egypt. Further research is needed to clarify the taxonomic status of these species.

Mesomeloe coelatus Reiche, 1857

Materials

a. country: Saudi Arabia; locality: Jabal Nakhlah; eventDate: 2/2/2023; associatedReferences: BSA_0026; occurrenceID: EFFB4E9D-7B35-5591-9A1C-81C6544E616F

b. country: Saudi Arabia; locality: Wadi Nakhlah; eventDate: 25/1/2023; associatedReferences: VLA_0373; occurrenceID: 429BC809-7C58-574A-8C2E-E814CB80EC3E
c. country: Saudi Arabia; locality: Jabal Nakhlah; eventDate: 2/2/2023; associatedReferences: VLA_0533; occurrenceID: BB4A9541-A4F8-5174-9E30-5A0A505D9AB8
d. country: Saudi Arabia; locality: Jabal Nakhlah; eventDate: 2/2/2023; associatedReferences: VLA_0551; occurrenceID: 99992924-3B53-50DB-99E2-CB8A678B5B95
e. country: Saudi Arabia; locality: Harrat Uwayrid; eventDate: 20/2/2023; associatedReferences: VLA_0890x; occurrenceID: 71330B71-A03E-51D1-9E50-ACD41AD5040E
f. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 4/3/2023; associatedReferences: VLA_1212; occurrenceID: D0B3E368-59D3-5D85-BEEE-CD0A30705DBD
g. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 4/3/2023; associatedReferences: VLA_1217; occurrenceID: A4E02731-D1BA-5D61-A218-C3CD2D3F2F0F
h. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 4/3/2023; associatedReferences: VLA_1228; occurrenceID: C7242FBC-179B-5C99-9E63-B6AD6B442720
i. country: Saudi Arabia; locality: Wadi Al Hamd; eventDate: 14/3/2024; associatedReferences: VLA_3115; occurrenceID: 86AA2887-7FBA-5EBA-817E-F24F063E2254
j. country: Saudi Arabia; locality: Jabal Nakhlah; eventDate: 3/2/2023; associatedReferences: VLA_4003; occurrenceID: DE2CEDDB-0869-57E6-81AB-C5CC4858BFFE

Diagnosis: Suppl. material 17.

Eurymeloe (*Bolognaia*) *saharensis* (Chobaut, 1898)

Material

a. country: Saudi Arabia; locality: Harrat Uwayrid; eventDate: 20/2/2023; associatedReferences: VLA_0890; occurrenceID: 506D0285-A5DB-5206-B2D3-67DC9ACB9343

Diagnosis: Fig. 8.

Nemognatha chrysomelina (Fabricius, 1775)

Materials

a. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 9/5/2023; associatedReferences: VLA_1518; occurrenceID: B4999358-B492-582F-BC43-952116E6AC19
b. country: Saudi Arabia; locality: Khaybar White Volcano; eventDate: 11/5/2023; associatedReferences: VLA_1616; occurrenceID: A679647F-5F35-5015-95BE-A91D065BCE02

Diagnosis: Suppl. material 18.

Figure 8. doi

Eurymeloe saharensis (VLA_0890). Photo credits Nikola Vesović.

Zonitoschema iranica Kaszab, 1959

Materials

a. country: Saudi Arabia; locality: Harrat Uwayrid; eventDate: 6/6/2023; associatedReferences: VLA_2092; occurrenceID: E1A469F8-B5B8-5D7B-BD7B-C606F5B0349E

b. country: Saudi Arabia; locality: Harrat Uwayrid; eventDate: 6/6/2023; associatedReferences: VLA_2100; occurrenceID: 99273815-B16E-589A-B7C4-038D6AD9E590

Diagnosis: Suppl. material 19.

Zonitoschema rubricolor Pic, 1924

Materials

a. country: Saudi Arabia; locality: Wadi Nakhlah; eventDate: 21/6/2023; associatedReferences: VLA_2282; occurrenceID: 261C711D-E5CD-5665-A6B3-5B983C64F5E8

b. country: Saudi Arabia; locality: Wadi Nakhlah; eventDate: 22/6/2023; associatedReferences: VLA_2305; occurrenceID: B4E8E878-05B9-58A0-94C0-F335A90770FA

Diagnosis: Suppl. material 20.

Genus *Sitaris*

Material

a. country: Saudi Arabia; locality: Harrat Uwayrid; eventDate: 5/6/2023; associatedReferences: VLA_3047; occurrenceID: 0A7635D1-81DB-5F05-9FC3-31DF49246BE3

Notes: This is the first record of this genus for the Saudi Arabia, but, as the genus has not been studied recently, the identification to the species level is currently not possible (Fig. 9).

Figure 9. doi

Sitaris sp. (VLA_3047). Bar size 5 mm. Photo credis Nikola Vesović.

Analysis

Distribution

Preliminary distribution patterns were found amongst the recorded meloid beetles (Suppl. material 21). In the study area, *L. angusticollis suturellus* was found in slopes of low-altitude mountains along the Red Sea coast, *L. brittoni* was apparently restricted to high-altitude rocky habitats in the Khaybar volcanic area, while *L. palaestinus* was found only in sandy habitats interspersed with sandstone outcrops. Apparently, there was clear habitat segregation between *Zonitoschema* species in the study area, where *Z. iranica* was observed in rocky habitats of Harrat Uwayrid, while *Z. rubricolor* was found in sandy areas characterised by well-developed vegetation. In the study area, specimens of *M. desertica* were observed in lowland areas along the Red Sea coast, where it occupies rocky habitats with sparse vegetation. *M. coelatus* was relatively widespread in the region, recorded from five protected areas. However, *E. saharensis* was found only at a single high-altitude site, where it co-occurred with *M. coelatus*. Two newly-recorded

species for the country, *H. borchmannianus* and *M. filicornis*, were also found in high-altitude areas of the Khaybar volcanoes. In contrast, *H. trizonatus* was found in sandy areas with abundant rock formations in the Gharameel region. In one of the most remote parts of Harrat Uwayrid, a single specimen of *Sitaris* was discovered in a small wadi formed along lava flow paths (Fig. 10).

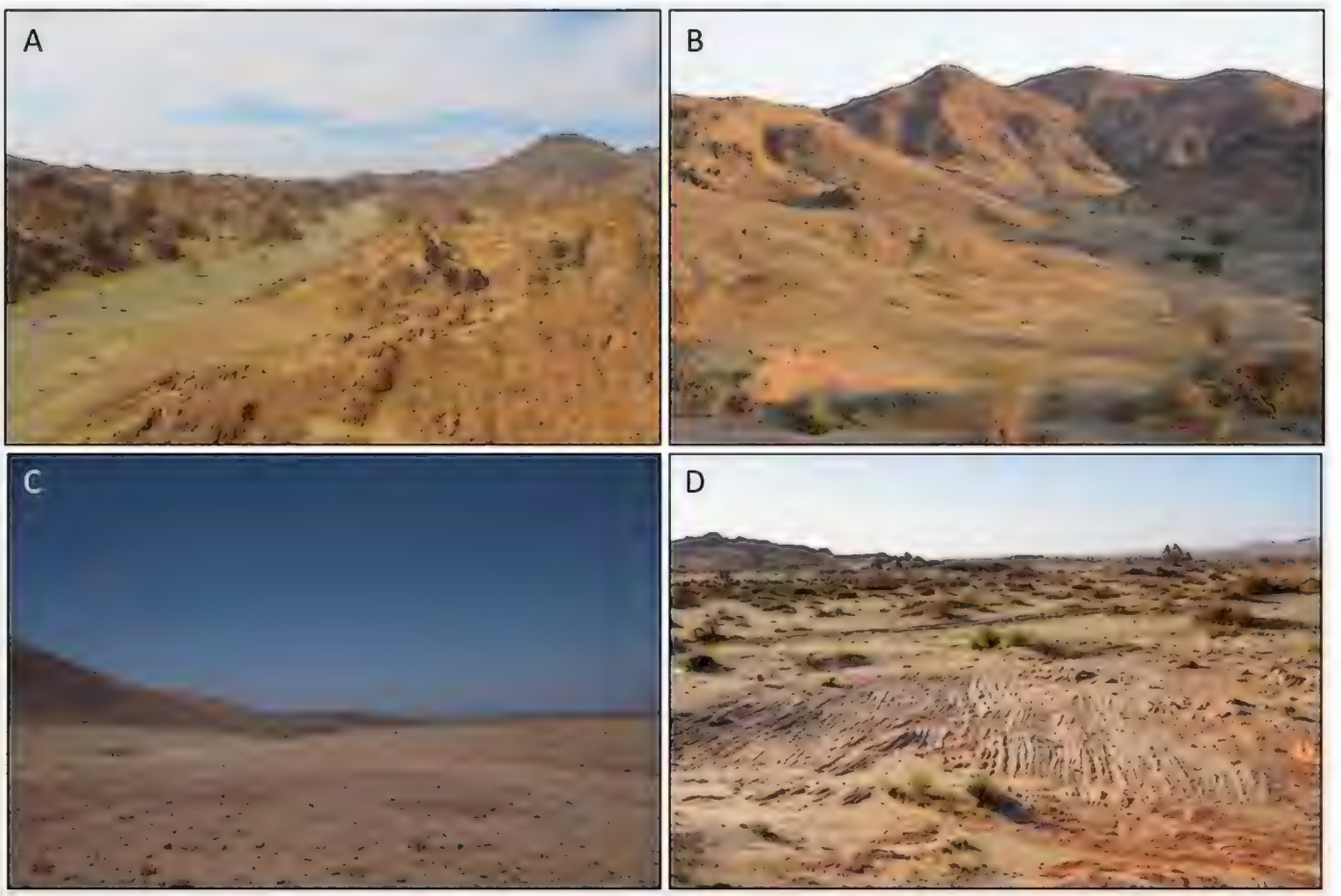

Figure 10. doi

Studied habitats. **A, B** sites of *M. desertica* in Jabal Ral and Triple Bay Mountains, respectively; **C** site of *H. borchmannianus* and *M. filicornis* in Khaybar White Volcano Geopark; **D** site of *H. trizonatus* in Gharameel.

The area of Khaybar White Volcano Geopark was particularly rich in meloid diversity. Of a total of 24 recorded taxa for the study area, 13 were present in this protected area. Besides that, of those 13 taxa, nine were found exclusively there (Fig. 11). This area is highly remote with low accessibility roads, hence it is one of the most well-conserved places in the study area. The area is represented by rocks, lava fields and a significant number of inactive volcanoes. It is rich in *wadis* formed in lava flows, which support a high abundance and diversity of vegetation (Suppl. material 22).

Discussion

In this study, a total of 21 species and three subspecies belonging to 11 genera of the family Meloidae were recorded from north-western Saudi Arabia. Amongst those, three species (*Hycleus borchmannianus*, *Hycleus trizonatus*, *Mylabris filicornis*) and one genus (*Sitaris*) are recorded for the first time in Saudi Arabia. With those discoveries, the number of recorded meloid beetles of Saudi Arabia totals 88.

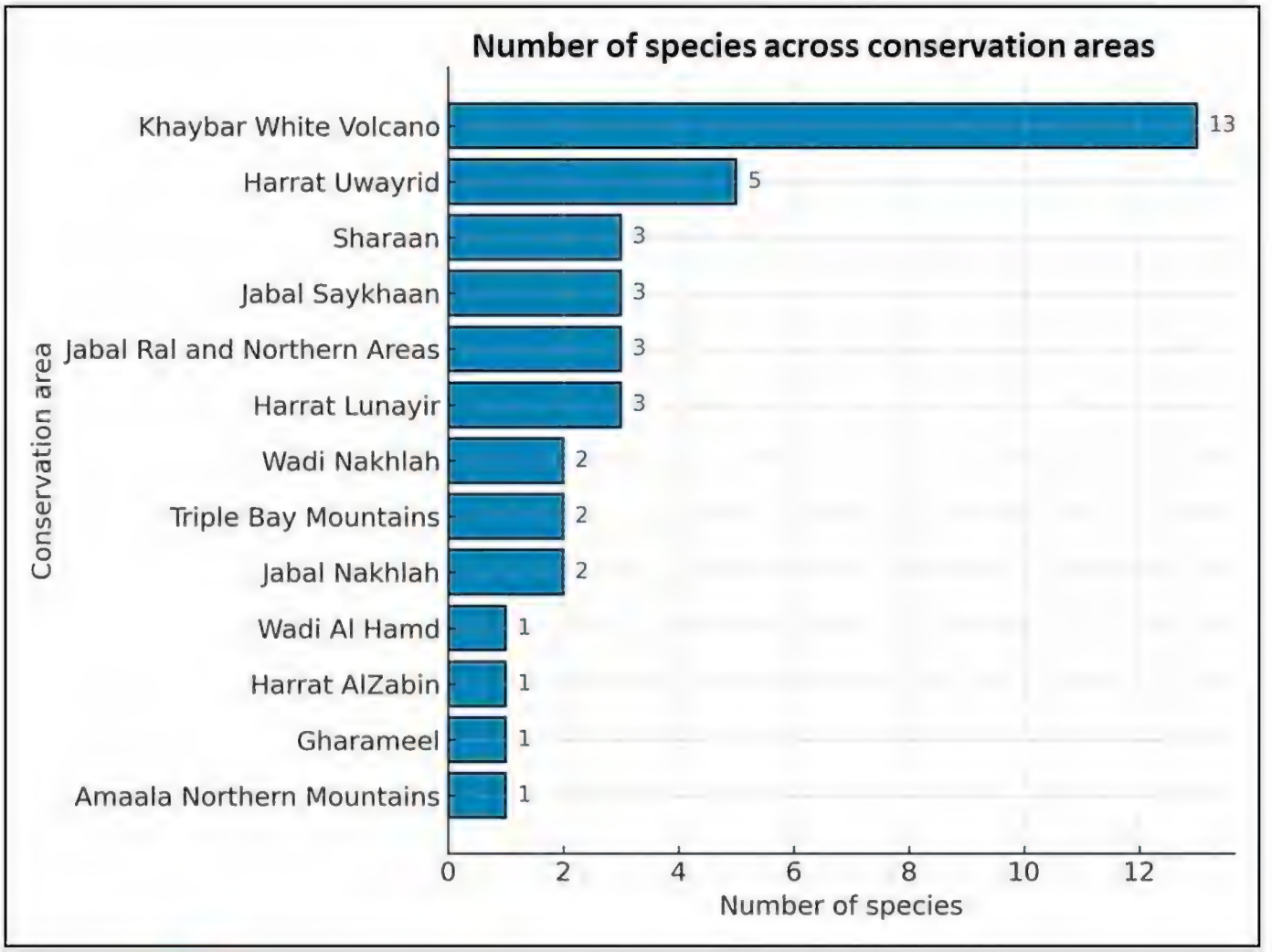

Figure 11. doi

Number of species recorded across conservation areas.

High-altitude volcanic habitats, particularly in the Khaybar region, emerged as hotspots of meloid diversity in the study area, with several species restricted to this unique landscape, including the two newly-recorded taxa for the country. The richness of the Khaybar White Volcano Geopark underscores the role of remote and relatively undisturbed habitats in supporting specialised beetle assemblages, while the discovery of rare taxa, such as *Sitaris* in isolated *wadis* further emphasises the importance of microhabitats formed by lava flows. In contrast, species, such as *M. coelatus*, exhibited broader ecological tolerance, occurring across multiple protected areas, whereas others, like *E. saharensis*, appeared highly restricted. Although, due to its cryptic lifestyle and winter activity, the apparently restricted distribution of *E. saharensis* we observed in the study area is likely a consequence of insufficient sampling, especially considering its known broad range (Ruiz et al. 2010, Sánchez Vialas et al. 2024). Together, these findings suggest that the mosaic of sandy plains, rocky outcrops and volcanic landscapes in the region creates distinct ecological niches that sustain a diverse meloid fauna, reinforcing the conservation value of these geologically and biologically unique habitats.

Overall, this study highlights that the north-western region of Saudi Arabia remains underexplored in terms of Meloidae diversity. As shown by existing literature and confirmed again by our results, the surveys in this region have led to the discovery of species or subspecies either new to the country or new to science (e.g. Licata et al. (2024)). This strongly suggests that additional fieldwork in these remote and diverse

habitats will yield further significant findings and contribute to a more comprehensive understanding of biodiversity in Saudi Arabia.

Acknowledgements

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References

- Abdel-Dayem M, Fad H, El-Torkey A, Elgharbawy A, Aldryhim Y, Kondratieff B, Al Ansi A, Aldhafer H (2017) The beetle fauna (Insecta, Coleoptera) of the Rawdhat Khorim National Park, Central Saudi Arabia. ZooKeys 653: 1-78. https://doi.org/10.3897/zookeys.653.10252
- Abdel-Dayem MS, El-Ghiet UMA, Elsheikh TM, Elgharbawy AA, Al-Fifi ZIA, Aldhafer HM (2020) The first survey of the beetles (Coleoptera) of the Farasan Archipelago of the southern Red Sea, Kingdom of Saudi Arabia. ZooKeys 959: 17-86. https://doi.org/10.3897/zookeys.959.51224
- Alzahrani A, Kehail MA, Almannaa S, Alkhalifa A, Alqahtani A, Altalhi M, Alkhamis H, Alowaifeer A, Alrefaei AF (2025) Seasonal occurrence and biodiversity of insects in an arid ecosystem: an ecological study of the King Abdulaziz Royal Reserve, Saudi Arabia. Biology 14 (3). https://doi.org/10.3390/biology14030254
- Batelka J, Bologna M (2014) Review of the Saharo-Sindian species of the genus *Zonitoschema* (Coleoptera: Meloidae), with description of new species from Tunisia, Yemen and Socotra Island. Acta Entomologica Musei Nationalis Pragae 54: 241-268.
- Bologna M, Turco F (2007) The Meloidae (Coleoptera) of the United Arab Emirates with an updated Arabian checklist. Zootaxa 1625 (1). https://doi.org/10.11646/zootaxa.1625.1.1
- Bologna M (2020) Meloidae. In: Iwan D, Löbl I (Eds) Ctalogue of Palaearctic Coleoptera. Vol. 5. Brill, Boston, 500-562 pp.
- El-Bana M, Brito J, Ferreira D, Coelho A, Campos J, Al-Ansari A, Al-Attas O (2025) Terrestrial baseline assessment of the Red Sea Zone: A brief report focusing on key biodiversity areas. Department of Environmental Protection & Regeneration, Red Sea Global, Riyadh, Saudi Arabia. 145 pp.
- El-Hawagry M, Khalil M, Sharaf M, Fadl H, Aldawood A (2013) A preliminary study on the insect fauna of Al-Baha Province, Saudi Arabia, with descriptions of two new species. ZooKeys 274: 1-88. https://doi.org/10.3897/zookeys.274.4529

- El-Hawagry M, Sharaf M, Al Dhafer H, Fadl H, Aldawood A (2015) Addenda to the insect fauna of Al-Baha Province, Kingdom of Saudi Arabia with zoogeographical notes. Journal of Natural History 50: 1209-1236. https://doi.org/10.1080/00222933.2015.1103913
- Fick S, Hijmans R (2017) WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. International Journal of Climatology 37 (12): 4302-4315. https://doi.org/10.1002/joc.5086
- Kaszab Z (1983) Insects of Saudi Arabia Coleoptera: Fam. Meloidae. A synopsis of the Arabian Meloidae. Fauna of Saudi Arabia 5: 144-204.
- Klug J (1834) Symbolae physicae seu icones et dscriptiones Insectorum que ex itinere per Africam borealem et Asiam occidentalem Friderici Guilelmi Hemprich et Christiani Godofredi Ehrenberg medicinae et chirurgiae doctorum studio nova autillustrate redierunt. Insecta. Berolini: Reimer
- Lehner B, Verdin K, Jarvis A (2008) New global hydrography derived from spaceborne elevation data. Eos, Transactions American Geophysical Union 89 (10): 93-94. https://doi.org/10.1029/2008eo100001
- Licata F, Pola L, Šmíd J, Ibrahim A, Liz AV, Santos B, Patkó L, Abdulkareem A, Gonçalves D, AlShammari AM, Busais S, Egan D, Ramalho RO, Smithson J, Brito JC, et al. (2024) The missing piece of the puzzle: A new and widespread species of the genus *Rhynchocalamus* Günther, 1864 (Squamata, Colubridae) from the Arabian Peninsula. Zoosystematics and Evolution 100 (2): 691-704. https://doi.org/10.15468/233ktv
- Olivier G (1811) Encyclopedie methodique, ou par ordre de matieres; par une societe de gens de lettres, de savans et d'artistes; precedee d'un vocubulaire universel, servant de table pour tout l'ouvrage, ornee des portraits de Mm. Diderot & d'Alembert, premiers editeurs de l'Encyclopedie. Histoire naturelle. Insectes. Tome huitieme. H. Agasse, Paris, 722 pp.
- Pardo-Alcaide A (1954) Études sur les Meloidae, VII. Note additive sur les Mylabrini du Maroc et du Sahara occidental espagnol. Bulletin de la Société des Sciences Naturelles et Physiques du Maroc 34: 367-368.
- Riccieri A, Spagoni L, Bologna MA (2024) Endemic and cryptic: different biogeographic histories of three Italian blister beetles of the genus *Meloe* (Coleoptera: Meloidae: Meloinae: Meloini). Insect Systematics and Diversity 8 (2). https://doi.org/10.1093/isd/ixae003
- Ruiz JL, Bologna MA, García-París M (2010) Taxonomía y distribución de Meloe (Eurymeloe) saharensis Chobaut, 1898 (Coleoptera, Meloidae), con nuevas sinonimias y primeros registros para Europa y la Macaronesia. Graellsia 66 (1): 85-96. https://doi.org/10.3989/graellsia.2010.v66.015
- Sánchez Vialas A, Ruiz JL, Roujas A, François A (2024) New data and threat status of two rare North African species of the subgenus Bolognaia (Coleoptera: Meloidae: Meloini: Eurymeloe). Graellsia 80 https://doi.org/10.3989/graellsia.2024.v80.745
- Sánchez-Vialas A, Ruiz J, Recuero E, Gutiérrez-Pérez F, García-París M (2022) A new systematic arrangement for the blister beetle genus *Eurymeloe* (Meloini, Meloidae, Coleoptera) with the description of a new species from Spain. ZooKeys 1109: 17-48. https://doi.org/10.3897/zookeys.1109.83863
- Sánchez-Vialas A, Ruiz J, García-París M (2021a) Taxonomic study of Mesomeloe coelatus (Reiche & Saulcy, 1857) (Coleoptera: Meloidae: Meloini), with the description of an overlooked new species. Zootaxa 5016 (3): 365-381. https://doi.org/10.11646/zootaxa.5016.3.3

- Sánchez-Vialas A, Recuero E, Jiménez-Ruiz Y, Ruiz J, Marí-Mena N, García-París M (2021b) Phylogeny of Meloini blister beetles (Coleoptera, Meloidae) and patterns of island colonization in the Western Palaearctic. Zoologica Scripta 50 (3): 358-375. https://doi.org/10.1111/zsc.12474
- Schneider W (1991) New records of Meloidae (Insecta: Coleoptera) from Arabia with description of a new species. Fauna of Saudi Arabia 12: 273-288.
- Serri S, Bologna M, Riccieri A (2020) Revision of the Hycleus sexmaculatus species group (Coleoptera: Meloidae, Mylabrini). Zootaxa 4790 (1). https://doi.org/10.11646/zootaxa.4790.1.1
- Song H, Bucheli S (2010) Comparison of phylogenetic signal between male genitalia and non-genital characters in insect systematics. Cladistics 26 (1): 23-35. https://doi.org/10.1111/j.1096-0031.2009.00273.x
- Trabucco A, Zomer R (2018) Global Aridity Index and Potential Evapo-Transpiration (ET0) Climate Database v2. CGIAR Consortium for Spatial Information (CGIAR-CSI). URL: https://cgiarcsi.community
- UNEP-WCMC (2019) User manual for the world database on protected areas and world database on other effective area-based conservation measures: 1.6. UNEP-WCMC, Cambridge, UK. URL: http://wcmc.io/WDPA_Manual

Supplementary materials

Suppl. material 1: Complete Meloidae dataset doi

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Suppl. material 21: Meloidae species distribution in the study area doi

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Suppl. material 22: Sites in Khaybar White Volcano Geopark. doi

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